MinnKota Cyclone

National Weather Service
WFO Eastern ND/Grand Forks **Spring/Summer 2002**

Our mission is to provide continuous hydrometeorological products and services, including accurate and timely forecasts and warnings, to the people of eastern North Dakota and northwest Minnesota.

The Importance of Spotters During the Nelson County, ND Tornado on July 18, 2001

by David Kellenbenz
Meteorologist

On the morning of July 18, 2001, the forecasters at the National Weather Service in Grand Forks were anticipating a busy severe weather day. During the early afternoon, a Tornado Watch was issued for eastern North Dakota into the evening hours by the Storm Prediction Center in Norman, Oklahoma. This meant that conditions were favorable for tornadoes to develop in and close to the watch area. Preparations began immediately at the weather office once the watch was issued. I was dedicated to working the radar, and issue any tornado and or thunderstorm warnings which may be needed for the region. Another person was dedicated to taking spotter reports, and relaying them to the radar operator. This person is called the communicator, and is vital to the warning process.

As thunderstorms began to develop during the mid afternoon of July 18, 2001, it was apparent that the atmosphere was ripe for tornadic development. A supercell thunderstorm developed rapidly around 5:30 p.m. in extreme southwest Nelson county. Around 5:55 p.m., reports began to flood the weather office that there was a tornado spotted in southwest Nelson county. The radar did not indicate a tornado at this time, but numerous spotters called in and reported the tornado. A tornado warning was issued immediately on the storm. The tornado lasted for over one half hour, and produced minimal F3 damage on the Fujita scale, mainly at the home of Nelson County Sheriff, Dale Quam.

The parent thunderstorm which produced this tornado developed into a mature, long-lived supercell thunderstorm, characterized by a strong rotating updraft. The tornado was initially hard to detect on radar, because it developed rapidly in less than one half hour. Therefore, spotter reports were critical in helping the National Weather Service in Grand Forks to issue timely and accurate warnings. Spotters are our Aeyes in the sky@ and provide valuable information to us. We also like to correlate spotter reports to what the radar is showing. This allows us to make conclusions when later radar data indicates storms during a particular severe weather event.

Thanks goes to all of our dedicated spotters around the region, who allow us to provide the most accurate and dependable warning service possible.

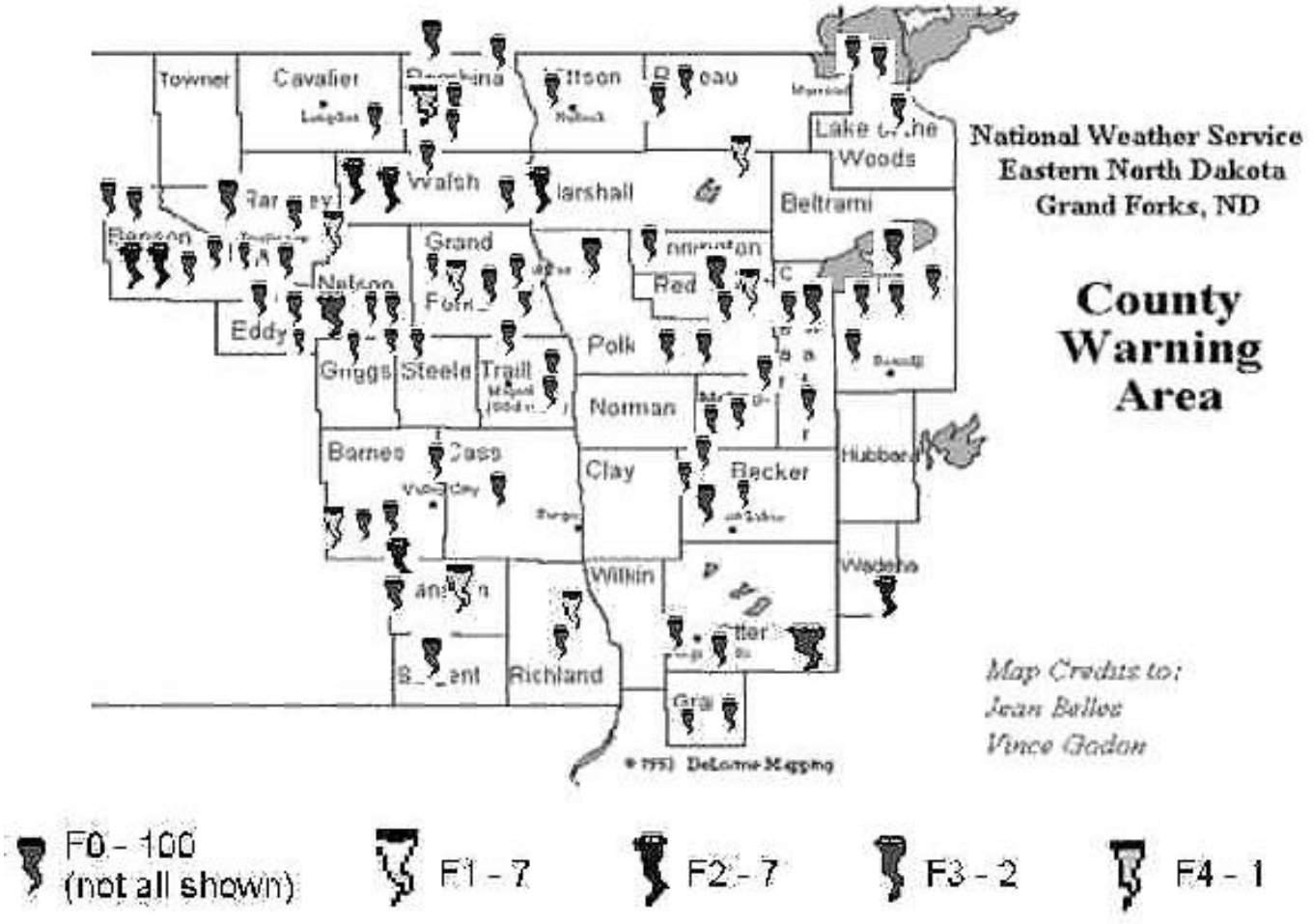
1998-2001 Tornado Touchdowns

By Dan Riddle
Senior Meteorologist

Who says that eastern North Dakota and northwest Minnesota have no severe weather? Over the last four years, there have been 117 confirmed tornadoes across our county warning area. Almost half of them occurred in 2001, when 52 tornadoes were reported. This was the fourth highest total in the nation. Through the efforts of NWS forecasters working with our spotters and amateur radio operators, warnings were issued well in advance and there was no loss of life. NWS Grand Forks had one of the best severe weather verification scores in the nation last year, and was in the top ten in the nation in 10 out of 12 verification categories. Average lead time for all tornadoes combined was 18.9 minutes in 2001.

The two most damaging tornadoes in 2001 were the F3 tornado which occurred on June 13th, near Parkers Prairie, MN and the F3 tornado which occurred on July 18th, near Pekin, ND.

Two F2 tornadoes occurred in the Maddock and Oberon areas of Benson county, ND on August 8th, damaging sheds, power poles, and a large grain elevator. An F1 tornado occurred north of Barney, ND in central Richland county on July 17th causing $100,000 damage to one home and several farm buildings.



Why Are Spotters So Important to the National Weather Service?

By Rod Donavon
Meteorologist

The major responsibility of the National Weather Service (NWS) is to help protect life and property by issuing warnings during hazardous weather situations. Despite having fancy gadgets and devices at their disposal to detect dangerous weather, meteorologists at the NWS still are partially blind to the situation. How big is the hail? How high are the winds? Is a tornado occuring? Meteorologists at the NWS will quickly issue a warning when radar indicates severe weather is likely or imminent. What is not known is what is actually happening underneath the storm. This is why trained storm spotters are very important to the NWS and the warning process.

When the NWS receives a severe weather report from a spotter, it is quickly disseminated to the public. Spotter reports also are very important to future warnings during an event. Since every severe weather situation is different, hail reports are very important. Once hail size is reported, meteorologists are able to use this valuable information and correlate it to data given by radar. Future warnings become much easier to issue because of the early spotter reports.

Several examples from the 2001 severe weather season show how important spotters are to the warning process. On May 15th, a supercell thunderstorm developed over Grand Forks county and was moving towards Grand Forks. A severe thunderstorm warning was issued because of the potential of damaging hail. However, since the cell was moving over a sparsely populated part of the county, no hail reports were received. It took a couple of meteorologists from the NWS to intercept the storm along I-29 southeast of Grand Forks and give the first hail reports. The storm would eventually drop 2.25 inch hail along the southern part of town.

On July 18th, a severe thunderstorm warning was issued on a rapidly evolving storm over southwest Nelson County in North Dakota. The storm developed so quickly that a tornado was reported by spotters before it was picked up by radar. The warning was instantly upgraded to a tornado warning. The tornado became the largest tornado of the season for the NWS in Grand Forks and was rated an F-3 on the Fujita Scale.

Finally, wind reports are critical to the NWS severe weather operations. Storms frequently pass in between wind sensors accessible to the NWS. Meteorologists rely heavily on spotters for wind reports. Estimated wind speeds and reports of wind damage to structures and trees are vital to the warning process.

Spotters are very important and much appreciated. A spotter training class will becoming to a location near you. Please plan to attend and help the NWS protect the life and property of your friends, neighbors and loved ones across Eastern North Dakota and Northwest and West Central Minnesota during this and future severe weather seasons.

Where do we need Cooperative Weather Observers? Below is a list of cities where Observers are needed.

North Dakota
- **Abercrombie**
- **Maddock**
- **McVille**
- **Park River**
- **Churchs Ferry**
- **Alice**
- **Fordville**
- **Cando**

Minnesota
- **Hallock**
- **Oklee**
- **Park Rapids**
- **Warren**
- **Mahnomen**
- **Hendrum**
- **Beltrami**

Weather Analysis and Radar Perspective of Parkers Prairie Tornado on June 13, 2001

By Dave Kellenbenz and Rod Donavon

A low pressure system was developing during the morning over the Central Plains, as a warm front began to surge northward into Iowa by early afternoon. The atmosphere near this warm front was characterized by extremely muggy and warm air, with surface dewpoints in the lower 70s. The warm front continued to move north during the mid afternoon into west central Minnesota, farther north than any model had predicted. Winds at about 3,500 feet above the ground were increasing from the south during the late afternoon near Parkers Prairie. This coupled with westerly winds near 20,000 feet, indicated strong wind shear in the atmosphere. The wind shear combined with the position of the warm front, put the Parkers Prairie area in a prime zone for tornadoes and very heavy rain from potential supercell thunderstorms.

National Weather Service Doppler Radar indicated thunderstorms developing in Grant county around 5:00 p.m. as they began to encounter an extremely moist and unstable environment. The thunderstorms intensified and several weak tornadoes were produced in Grant County during the next several hours. One of the stronger supercell thunderstorms moved out of Grant County, and had its sites set on the southeast corner of Otter Tail county. This thunderstorm began to exhibit mid level rotation as it moved just north of the warm front, traveling east northeast into Otter Tail county. The thunderstorm continued to intensify and began to exhibit strong circulation around its center, which was wrapped with very heavy rain. This type of thunderstorm is called a High Precipitation (HP) supercell. This can be the most dangerous type of thunderstorm because the tornado is very hard or impossible to see because of the heavy rain.

An important aspect to forecasting tornadoes is studying the environment which thunderstorms are developing in. Early in the thunderstorms life cycle, before the radar was indicating a tornado, meteorologists at the National Weather Service Forecast Office (NWSFO) in Grand Forks were performing hand meso-analysis of the surface fields. A meso-analysis is a detailed analysis of pertinent weather elements. It was this analysis that tipped forecasters off to the likelihood of tornadoes given the environmental conditions. The meso-analysis done early in the afternoon were indicating differences between current data and model data. The analysis enabled the radar operator to issue tornado warnings instead of severe thunderstorm warnings once the thunderstorms developed.

Another important aspect to the warning process is the use of Doppler Radar. Doppler Radar gives meteorologists the ability to see rotation in a storm. The radar performed well during the event, and gave the radar operator every indication that the storm was tornadic. Once these two pieces of the puzzle are put together, then a better decision can be made about what type of severe weather warning to issue. On this night, it was determined tornadoes were the main threat and tornado warnings were issued. The actions taken by the NWSFO in Grand Forks on June 13th led to a tornado warning being issued 32 minutes before the tornado occurred in Grant county and 41 minutes before the tornado occurred near Parkers Prairie in Otter Tail county.

The information below is a time line of the actions taken by the staff at the NWSFO in Grand Forks as they followed this tornadic supercell.

At 4:01 p.m., the NWS updates the Hazardous Weather Outlook(HWO). The HWO states there is a moderate risk of severe weather south and east of a line extending from Forman to Fargo to Park Rapids. The main severe weather threats are tornadoes and large hail with the time of concern being from 4:30 p.m. until 11:00 p.m.

At 4:50 p.m., a short term forecast is issued for Grant county when thunderstorms begin to develop and move into the area. The forecast alerts the public that the storms may soon become severe and that tornadoes could form with little or no warning.

At 4:55 p.m., the NWS begins coordination with the sheriff=s office in Grant county. Trained storm spotters are sent out to watch a strengthening storm over the southwest part of the county. In order to gain a first hand perspective, the NWS begins to call spotters near the storm. No severe weather is reported.

At 5:08 p.m., the NWS issues the first tornado warning of the night for Grant county in effect until 5:45 p. m. The warning is issued when NWS Doppler Radar indicates a tornado 9 miles south of Herman. A few cities mentioned in the path of the storm included Herman, Norcross and Barrett.

At 5:40 p.m., 32 minutes after the tornado warning was issued, the Grant county sheriff=s office reports

that a tornado was spotted 8 miles southeast of Barrett. The tornado is a brief touchdown and only lasts for a few minutes. With the first warning set to expire, the tornado warning for Grant county is reissued at 5:43 p. m. and is in effect until 6:15 p.m. No other tornadoes are reported in the county and the storm moves out of the NWSFO Grand Forks= County Warning Area (CWA) when it crosses into Douglas county. The storm remains a threat for the Grand Forks office=s CWA, however, as the northeast path points to Otter Tail county.

At 5:45 p.m., communication between the NWS and the Otter Tail sheriff=s office begins. Meteorologists at the office continue to monitor the storm over Douglas county and note that the storm continues to strengthen. The storm continues to move northeast with rotation indicated by radar.

At 6:12 p.m., the NWS issues a tornado warning for southeast Otter Tail county until 7:00 p.m. as radar indicates that the storm contains strong rotation as it nears the county. The warning states that Urbank and Parkers Prairie are in the path of the storm. Communication between the NWS and the sheriff=s office becomes more frequent. Storm spotters are strategically dispatched along the projected path.

At 6:34 p.m., a Severe Weather Statement (SVS) is issued as a midterm statement for the tornado warning. The SVS reads that radar indicated a tornado 15 miles southwest of Urbank and would be near Parkers Prairie at 6:55 p.m. Communication with the Otter Tail sheriff=s department becomes nearly continuous. The NWS notifies the sheriff=s office that radar places the strongest rotation within the heavy rain core and any tornado would be very hard to see and rain wrapped. Spotters should use extreme caution.

At 6:53 p.m., The Parkers Prairie Fire Department spots a tornado 1 mile west of town. The tornado plows a 12 mile path of destruction as it damages several homes and farmsteads along the way. The NWSFO in Grand Forks dispatches a storm survey team the following day. The tornado is rated an F3 based on the Fujita Scale with peak winds estimated to be up to 170 mph.

Lightning Kills, Play It Safe

Lightning Safety Awareness Week: April 28 – May 4, 2002

Summer is the peak season for one of the nation's deadliest weather phenomena – lightning. Safeguarding U.S. residents from dangerous lightning is the goal of NOAA's new public awareness campaign – "Lightning Kills, Play it Safe." The campaign is designed to lower lightning death and injury rates and America's vulnerability to one of nature's deadliest hazards.

In the United States, an average of 73 people are killed each year by lightning. That's more than the annual number of people killed by tornadoes or hurricanes. Many more are struck but survive. However, they often report a variety of long-term, debilitating symptoms, including memory loss, attention deficits, sleep disorders, numbness, dizziness, stiffness in joints, irritability, fatigue, weakness, muscle spasms, depression, and an inability to sit for long.

Lightning: The Underrated Weather Hazard

The Threat

Lightning is the #2 storm killer in the U.S., killing more than hurricanes or tornadoes. Only floods kill more. But the real story of lightning isn't the deaths,

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Lightning

National Weather Servce Cooperative Observer A Perspective

The National Weather Service (NWS) has been tasked with the issuance of severe weather watches and warning designed to protect life and property. To this end, the collection of timely and accurate surface weather data is vital. In addition to the protection of life and property, the Department of Commerces' National Oceanic and Atmospheric Administration (of which the NWS is a part) has been given the job of maintaining a data base of climatic weather information. This too is used by the NWS in preparing medium and long range forecasts.

These two jobs have the Cooperative Observer Program (Co-Op Program for short) in common. The Co-Op Program is the backbone of the United States Climatological database. Co-Op observers frequently act as severe storm spotters, phoning in reports of hazardous weather in the winter and summer.

What is the job of a C0-Op observer?

Being an NWS Co-Op observer can be a demanding job. To provide accurate and complete weather data, observations are required seven days a week, 365 days a year. This does not mean that someone has to be monitoring the "weather" all the time. Instruments are provided to monitor temperature and precipitation. Yet someone should be available to **record** the daily maximum and minimum temperature, the precipitation, and snowfall. This generally is done around 7 a.m., but observation times can be shifted to fit the observer's schedule.

Cooperative observers typically perform their duties for 25, 30 or even 40 years or more before handing the duties off to others. Some have even worked as a cooperative observer for 75 years! Institutions, such as universities, can have weather record dating back to the 1700's. These sites become Historic Climate Networks, which are the backbone of the national climate data network.

What equipment do observers use?

Depending on the level of service expected, equipment can vary from a simple 8 inch non recording plastic or metal rain gauge to a full coop station with electronic thermometer and recording precipitation gauge. The placement and type of Cooperative Weather Observers (CWOs) is determined by the National Climate Data Center (NCDC) as requested by the NWS Representative (NWSREP). Generally, Co-Op stations are evenly spaced in relatively flat terrain (more that 30 miles apart) but may be closer together in hilly terrain or under special circumstances.

The NWSREP will deliver, set up and maintain the necessary equipment. Typically, the Co-Op station consists of a set of max/min thermometers or a max/min temperature system (MMTS) and a raingauge. There are two basic types of raingauges – recording and non-recording. Non-recording rain gauges consist of a metal tube approximately 8 inches in diameter and 3 feet tall with a removable funnel and inner plastic or metal measuring tube. Precipitation is measured by placing a calibrated stick into the tube, seeing where the water marks the stick and recording the data.

A recording rain gauge has either a drum which holds a paper chart or a drive mechanism which punches holes in a strip chart to record precipitation. At the end of each month, the charts are forwarded to the local NWS office for QA then forwarded to NCDC.

What happens with the information collected daily?

Data can be transmitted to the local NWS office via telephone using a PC based system call PC-ROSA, or data can be called in on a voice system. This near real-time data is used to support the day-to-day operations of the NWS in its recast and warning decisions.

Who do I contact?

The NWS in Grand Forks operates and maintains the Cooperative Weather Observer program for eastern ND and northwest MN. If you are in or near one of the target cities where we need cooperative weather observers, call the NWS at 701-772-0720, ext. 327, and ask to speak with a Cooperative Program Manager. Or you can write us at:

National Weather Service
4797 Technology Circle
Grand Forks, ND 58203-0600

(continued from page 5)

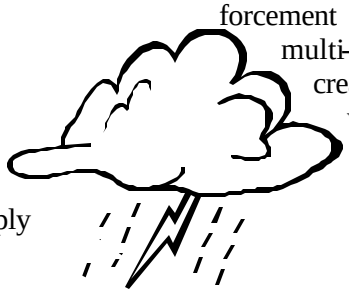
it's the injuries. Only about 10% of those struck are killed; 90% survive. But of the survivors, the large majority suffers life-long severe injury. These injuries are primarily neurological, with a wide range of symptoms, and are very difficult to diagnose. Lightning also causes about $5 billion of economic loss each year in the U.S.

The Solution

Public education is the key! The vast majority of lightning casualties can be easily, quickly, and cheaply avoided, if only the public knew what to do. The public needs increased awareness of the lightning hazard and increased knowledge of lightning safety.

Lightning Safety

Lightning safety is easy. But lightning safety is also inconvenient. It requires diligence and continual reinforcement and encouragement. Lightning safety is a multi-step process, with each step providing a decreasing level of protection – plan around the weather, and have a lightning safety plan.



Lightning Facts from the National Weather Service…

… The three most common types of lightning are in-cloud, cloud-to-cloud, and cloud to ground.

… The rapid heating and cooling of air in and near the lightning channel causes a shock wave that we hear as thunder.

… The air in the lightning channel is heated up to 50,000 degrees Fahrenheit – hotter than the surface of the sun.

… The visible light from a flash of lightning travels at the speed of light (almost instantaneous); the shock wave we hear as thunder travels at the speed of sound (about 1100 feet/second). To determine the distance between you an a lightning strike, divide the number of seconds between the visible lightning flash and sound of the thunder by 5 to obtain the distance in miles. For example: 30 seconds divided by 5 gives a distance of 6 miles.

… "Heat lightning" is lightning that is too far away for the thunder to be heard.

… The electrification of thunderstorms is caused by the movement of water and ice particles within the thunder storm cloud.

… Most lightning fatalities are male (84% male, 16% female)

… July is the month with the greatest average number of lightning fatalities (July averages 26 fatalities each year which is about 29% of total yearly fatalities).

… Florida ranks as the state with the greatest average number of fatalities (10 fatalities/year, average 11% of total fatalities).

… Sunday ranks as the day of the week with the greatest average number of lightning fatalities (16 fatalities/ year, averages 18% of total fatalities).

… Lightning gets less media attention than tornadoes or hurricanes because it generally claims its victims one at a time, and does not cause widespread destruction.

… Prior to the visible flash of lightning in a typical cloud-to-ground lightning stroke, a nearly invisible channel of electrical charge known as a "step leader" begins moving through the air to the ground.

… A person's hair standing on end in the vicinity of a thunderstorm is a sign that lightning is likely to strike in the vicinity very shortly.

… The United States experiences about 25 million lightning flashes per year.

… Keraunomedicine is the study of the medical aspects of lightning injuries.

… People struck by lightning do not carry an electrical charge and should be attended to immediately. CPR is needed immediately in cases of cardiac arrest.

… Open porches are not safe in thunderstorms.

MINNKOTA CYCLONE
NATIONAL WEATHER SERVICE

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National Weather Service

We're on the web!
Http://www.crh.noaa.gov/fgf

Upcoming Summer Season Awareness Weeks and Drills:

National Lightning Safety Awareness Week, April 28th - May 4th.
http://www.lightningsafety.noaa.gov/

Minnesota Severe Storms Awareness Week, April 15th - April 19th.
MN Statewide Tornado Drill Day, April 18th.

North Dakota Severe Weather Awareness Week, April 29th - May 3rd.
ND Statewide Tornado Drill Day, May 2nd.